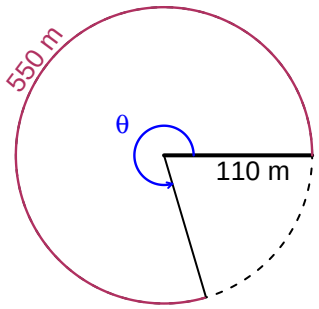
Name: Date:

Trig Final (Solution v11)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 550 meters. The radius is 110 meters. What is the angle measure in radians?

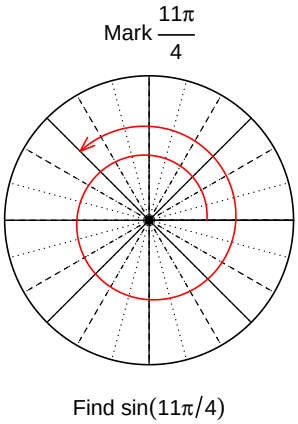


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

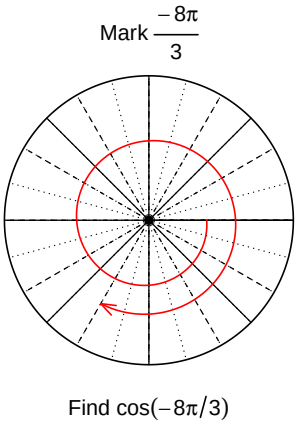
$\theta = 5$ radians.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{4}\right)$ and $\cos\left(\frac{-8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(11\pi/4)$



Find $\cos(-8\pi/3)$

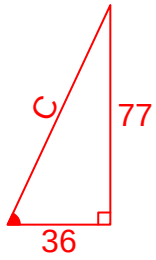
$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-8\pi/3) = \frac{-1}{2}$

Question 3

If $\tan(\theta) = \frac{-77}{36}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

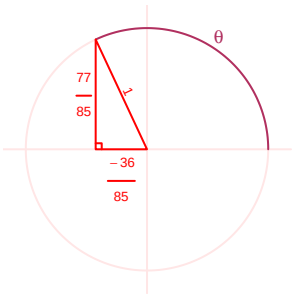
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + 77^2 = C^2$$
$$C = \sqrt{36^2 + 77^2}$$
$$C = 85$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{77}{85}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.25 Hz, an amplitude of 2.18 meters, and a midline at $y = 6.64$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.18\cos(2\pi 8.25t) + 6.64$$

or

$$y = -2.18\cos(16.5\pi t) + 6.64$$

or

$$y = -2.18\cos(51.84t) + 6.64$$